LXI.—*Notes on* Pelonaia corrugata.

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[Plate XII.]

A brief description (with drawings) of this animal was read in Section D of the British Association, in August last, under the idea that it was a new molluscoid animal—a mistake which arose from the defective descriptions and figures of Messrs. Forbes and Goodsir in the 'Edinburgh Philosophical Journal' and the 'British Mollusca' of Messrs. Forbes and Hanley. Prof. Huxley, in remarking on the paper, observed that the dependence placed on the descriptions of the above-mentioned authors was too great, and he thought the animal was a *Pelonaia*. I am especially indebted, however, to the late Mr. Joshua Alder, who examined the specimen, its description, and the drawings, for much valuable information on the subject, as well as for the accurate determination of the species.

The specimen (Pl. XII. fig. 1) from which the original description was drawn up had been about four years in spirit before an examination showed its true nature; and then, unfortunately, the state of the preparation prevented so precise an examination as might have been desirable. The transmission of another small specimen, however, in a fresh condition has enabled me to correct some doubtful points in the previous description. Both examples were procured at St. Andrews, by relatives,—the larger being cast on shore after a severe storm, the smaller occurring amongst the débris from the deep-sea fishing off the Bay*. Both were injured at the anterior end. The following description is thus necessarily fragmentary.

The test in the larger example measures about $1\frac{3}{4}$ inch in length, possesses a club-shaped outline, and is of a brownish-sandy colour, resembling an elongated Florence flask with the bottom a little produced and the neck much elongated. In the other specimen the form is more strictly club-shaped, the bulbous end being smaller in proportion to the stalk. The case is rough to the touch, like sand-paper, and bears at the bulbous end a series of minute hairy processes, while the apertures are situated at the extremity of the elongated portion. In structure the external tunic is fibrous, dense, and elastic, and, with the exception of the terminal portion of the smaller end in the larger specimen, loaded with minute and closely adherent sand-particles imbedded in a hyaline matrix. Like the more regular and exquisitely fitted, though larger-grained and less elastic

* A third, much less coated with sand, has just been sent from the same locality.

tubes of *Pectinaria belgica*, the test is little affected by hydrochloric acid or caustic potash, the former only disengaging a few bubbles of gas from some calcareous fragments, the latter rendering the basis structure more translucent, but not destroying its cohesion. Such an investment, as usual, is calculated to restore the shape of the animal, by whatever means alteration is brought about. In the smaller specimen the transverse wrinkles were very distinctly marked, encroaching even on the bulbous end. So firm was the test in the latter, that very considerable pressure produced no alteration. The test, however, varies much in this respect in different examples.

The hairs are evidently essential parts of the test of the animal, like those of *Cynthia ampulla*. Microscopically, they present a rugged, semiopaque, fibro-granular aspect, having a hyaline basis structure containing many granules, with granular débris of mud and sand attached to it. The sand-particles were often largest at the base of each process; and the edges were rough from projecting threads of the basis structure with adhering débris. On the whole, the process was much finer than that of *Cynthia ampulla*, which, under the same power (350 diam.), showed a great increase of coarse sand-particles, Diatomaceæ, sponge-spicula, and Foraminifera, together with Crustacean and Annelidan hairs, shells of *Cyprides*, and other débris.

Underneath the external matrix of the test generally is a layer of interlaced broad fibres, which cross each other at right angles, the longitudinal ones being somewhat fasciculate, the circular less so. The individual fibres (fig. 4) are of large size and faintly striated longitudinally, and some contain traces of nuclei. At some parts a cellulo-granular texture is incorporated with the layer, the fibres in that case following for the most part one direction, and leaving intervals between the fasciculi, in which the cellulo-granular structure is situated. This, however, may have been due to the ordinary epithelial lining of the layer superseding it. This muscular coat is very easily separated from the whitish internal surface of the test in spirit; and in the fresh specimen it is scarcely more difficult, with the exception of the narrow portion, where the fibres adhere to the test more firmly. It is also proportionally thicker in the latter region. The general appearance of the layer is shown in fig. 2, *f*.

On removing the soft pinkish textures from the test, the appearance is as represented in fig. 2, a great portion of the body of the animal being occupied by the branchial apparatus, which lies within the muscular coat. When minutely examined with the naked eye or a lens, this structure is found to be ribbed

longitudinally and crossed by regular transverse bands, on the whole somewhat resembling the same apparatus in *Boltenia**. Under a power of 90 diam. (fig. 5), the longitudinal fibrous bands (*a*) are crossed by circular belts (*b*) of nearly equal thickness, and the square or oblong spaces thus formed are again subdivided by more slender bands (*c*). All these bands project inwards from the ovoid branchial spaces; and thus, when viewed from the inner surface, the latter are in the background, as in the figure. A portion of the branchial membrane, somewhat compressed, and with the small circular band (*c*) removed, is represented from the spirit preparation in fig. 6, × 200 diameters. The aperture is surrounded by a well-defined minutely granular rim of cells, which cells in life are covered with long and powerful cilia, whose remains are apparent even in the spirit preparation. The branchial fenestrated membrane is continued along the stalk of the animal to the oral aperture (*a*, fig. 2). This oral aperture, when removed from the test, is found to be situated in the largest and most muscular of the terminal cones; and when this is contracted, a little within the opening are a number of small red specks. Below these is a ring of minute filiform tentacles (fig. 3), composed of a transparent basement structure, with numerous granules.

The termination of the slender end in the larger example as seen under a lens is shown in fig. 7; and it had a less sandy investment than the rest of the animal: indeed towards the end the sand-particles obtained an individuality not seen elsewhere, from the predominance of the tough basis substance. In the smaller specimen this part was similar to the rest in this respect. The oral aperture is seen at *a*, and the anal at *b*. Each of these apertures had a concentric and finished arrangement of carunculæ and papillæ externally. The external investment of the narrowed portion is the densest on the animal, though, as above mentioned, the sand-particles are less closely set towards the tip. The glistening white fibrous lining of the test is also thickened; it becomes more yielding where it expands to meet the bulbous portion. The muscular layer of this part formed a powerful tube (*f*, fig. 2) of external circular and internal longitudinal fibres.

The endostyle lies along the side of the branchial chamber (*g*, fig. 2), and forms a somewhat zigzag pinkish band. A portion from the larger specimen is seen in fig. 9, viewed under a lens. This structure looks like a simple folded basement membrane, with a closely set series of granular cylindrical epithe-

* Savigny, 'Mémoires sur les Animaux sans Vert.' 2nd part, 1er fascic. pl. 5. I am indebted to Dr. Lauder Lindsay for kindly placing a specimen of *Boltenia* from Otago, New Zealand, at my disposal.

lium-cells (fig. 10), tipped with a vigorous array of cilia, which are shorter than those in the fenestræ of the branchial membrane.

The mouth, opening freely at the bottom of the branchial sac, leads into a muscular œsophagus, which is readily distinguished from the intestine by its emptiness. It is marked externally by longitudinal striæ in its ordinary state, and is lined with a very closely set layer of cylindrical epithelium richly ciliated on the inner surface. Some of the separated cells are represented in fig. 11. When viewed under pressure, the membrane has often a minutely cellular appearance, the ends of the cells only being visible. The equally muscular stomach is of a dull orange hue, and is marked by longitudinal rugæ which have a somewhat regular arrangement. The colour is due to the presence of the liver-cells (figs. 12 & 13), which form dense yellowish masses arranged in a longitudinal manner. Numerous branching bile-ducts were also apparent, many of them having cæcal extremities. Portions of these are seen in fig. 14; and they appeared to be lined with epithelium. The inner surface of the stomach, again, is furnished with a curiously folded arrangement of glandular membrane (fig. 15), with its inner surface richly ciliated. These folds are composed of cylindrical ciliated, and rounded granular cells (fig. 16). The addition of a little sulphuric ether to a slide from the stomach brought out at some parts a beautiful series of fusiform nucleated cells or cell-fibres (fig. 17); but their exact anatomical relations could not be made out. The yellowish colour of the stomach is traced to the pylorus, after which the alimentary canal (*h*, fig. 2) becomes less muscular, and, in the present instance, is loaded with muddy débris. The inner surface of the intestine is covered with large rounded glands having fatty globules in their interior, which are shown under pressure in fig. 18. Numerous Diatomaceæ occurred amongst the muddy débris in the intestine. The gut terminated superiorly at the anal opening. The foregoing organs are retained *in situ* by delicate membranous bands.

Lying to the outer side of the branchial membrane in the larger specimen were two rows of bodies like ova (*d*, *d'*, fig. 8), which proceeded from the bulbous portion for some distance along the stalk. They had the usual structure, viz. granular contents, large nucleus, and nucleolus, as shown in fig. 19. The ova varied in size from $\frac{1}{150}$ to $\frac{1}{90}$ inch or more.

The inner surface of the bulbous portion had numerous projecting and somewhat pediculated bullæ, indicated at *o*, fig. 2, which, in the larger specimen, were marked externally (within the test) by one bulla, and in the smaller by two. These organs are evidently glandular; and a portion of one is shown, × 350

diam., in fig. 20. Its entire surface is studded with granular glands. At *r* (fig. 2), entangled in the lining membrane, was, in each specimen, a small reddish grain, apparently of a fatty nature.

In the angle between the oral and anal openings is the opaque pinkish nerve-ganglion, composed of minute, granular nerve-cells. The branches have a granular appearance.

EXPLANATION OF PLATE XII.

Fig. 1. *Pelonaia corrugata*, of nearly the natural size.

Fig. 2. View of the animal removed from its test, and enlarged under a lens: *a*, oral aperture slit open; *b*, pink anal cone; *c*, oral tentacles; *d*, nerve-ganglion; *e*, red pigment-specks; *f*, muscular sheath; *g*, endostyle; *h*, intestine bulged with muddy débris; *i*, branchial chamber; *m*, œsophagus; *n*, pyloric extremity of stomach; *o*, prominent and somewhat pediculated glandular organs; *p*, stomach; *r*, reddish granule.

Fig. 3. Tip of one of the oral tentacles, × 350 diameters.

Fig. 4. Fibres from the muscular coat, × 350 diam.

Fig. 5. Arrangement of the branchial apparatus: *a*, longitudinal bands; *b*, large circular bands; *c*, slender circular bands; *e*, branchial spaces surrounded by rim; *f*, portion of the endostyle, × 90 diam.

Fig. 6. A few of the branchial spaces, with cilia at *c*, × 200 diam. The slender circular band has been removed.

Fig. 7. Smaller end of the larger example, as seen under a lens: *a*, oral aperture; *b*, anal aperture.

Fig. 8. The larger specimen with its test laid open, and the parts removed so as to show the rows of ova, &c.: the conical ending of the muscular coat is seen at *a*; *b*, bulla on the exterior of the latter, indicating the region of the pediculated glandular organ; *c*, detached mass containing stomach &c.; *d*, *d'*, rows of ova; *e*, test.

Fig. 9. Endostyle of spirit preparation, magnified under a lens.

Fig. 10. Cylindrical epithelium of the same, × 350 diam.

Fig. 11. Cylindrical epithelium of œsophagus, × 350 diam.

Fig. 12. A few loose hepatic cells, × 350 diam.

Fig. 13. Portion of the yellowish longitudinal streaks (of liver-cells) from stomach, × 350 diam.

Fig. 14. Portions of hepatic ducts, × 350 diam.

Fig. 15. Outline appearance of the glandular plaits in stomach, with hepatic ducts, × 90 diam.

Fig. 16. Fragment of the plaited structure under pressure, × 350 diam.

Fig. 17. Fusiform cells from stomach, after the addition of sulphuric ether, × 350 diam.

Fig. 18. Large glands of intestine, × 350 diam.

Fig. 19. Ova, × 200 diam.

Fig. 20. Apex of one of the pediculated glandular organs in swollen part of animal, × 350 diam.